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Analysis of Maintenance and Repair Work in Residential Building

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ABSTRACT: Building defects are common phenomena especially for those old residential apartments. Lack of management in maintenance is one of the factors which is the reason for poor building condition. Despite the authorities in charge of building maintenance, the residents are also a factor contributing to poor maintenance on building.

Misusing the facilities, poor management team, insufficiency of fund for maintenance, the use of poor-quality material by the maintenance department, improper maintenance strategy often cause maintenance to achieve a result less than expected.

The aim of this research is to assist clients and customer in improving the maintenance quality in India. This study introduces to the fundamental concepts of construction management, with emphasis on increasing the efficiency and quality of residential building with the help of mobile application. Research study on building maintenance is used as literature review to figure out a feasible or not for maintenance of residential building in this research.

Certain key considerations and problems that are faced are highlighted so as to broaden the understanding of the subject. The investigation represents an exercise in performing the essential tasks that constitute a preliminary budget and plan. The conclusions include observations and suggestions that need to be considered while attempting such a job in practice.

This research focuses on how we can enhance the quality and accelerate the time required to get the work done.

The use of MEP consultant can improve the efficiency of quality and duration of the work,

as MEP layout enable user to have a quick access to reason of the problem before developing into a major issue, deciding upon the service provider to hire based on the ratings, scheduling according to user's convenience, giving an intimation of cost of the service user will have to bear.

KEYWORDS : Repair, Maintenance, MEP, Residents, Delay and Consultant.

I. INTRODUCTION

Now a days, construction activity is the second largest activity in the world. This construction activity provides largest economy to the country and helps in development of the country and provides important role in urbanization, development of economy and standard of living of peoples.

Maintenance is the process of ensuring that buildings and other assets retain a good appearance and operate at optimum efficiency. Inadequate maintenance can result in a decay, degradation and reduced performance and can affect health and threaten the safety of users, occupants and other in the vicinity.

Depending on its design, quality of materials and workmanship, function and location, building deteriorate at different rates and require different levels of attention. No building will ever be maintenance-free, but the quality of the design and workmanship can minimize the level required.

Maintenance is the process of ensuring that buildings and other assets can retain a good appearance and operate at optimum efficiency. Inadequate maintenance can result in decay, degradation and reduced performance and affect health and threaten the safety of users, occupants and others in the vicinity.

Data collected from respective sites are analysis through relative importance index and it helps to find out the major repair work post possession of the residents. The emergence of maintenance application can improve the efficiency of quality and duration of the work, as mobile applications enable user to have a quick access to services provider available, deciding upon the service provider to hire based on the ratings, scheduling according to user's convenience, giving an intimation of cost of the service user will have to bear.



II. RESEARCH OBJECTIVE

This research aims at concluding whether a mobile application is feasible or not for repair and maintenance of residential building. To achieve the aims,

Objectives have been identified as follows:

- To study the type of repair and maintenance are to be made in residential building.
- Thorough data collection regarding maintenance and repair of residential building.
- To study the various reasons for no approach toward MEP.
- Collect data through survey or questionnaire.
- Analyse the data for repair and maintenance.

III. LITERATURE REVIEW

1. 'A REVIEW STUDY OF MAINTENANCE AND MANAGEMENT ISSUES IN IBS COMMERCIAL BUILDING' -

BY- MohdNasrunMohdNawi, Nurul Azita Salleh, Herman Shah Anuar.

School of Technology Management & Logistic Universiti Utara Malaysia 06010, Sintok, Kedah, Malaysia.

Findings: -

- The problems and issues that appear in the building management in commercial building in Malaysia as parts of the efforts to enhance the building value.
- Good management of the building will be able to influence the quality of the buildings that remain long, safe and beautiful without any damage and problems.
- In addition, building a good management can ensure that the facilities available in the building are well and meet the standard.
- Exposure to the problems and needs in the management of the building would be able to help improve building management systems to be more effective.

2. 'Different Approaches to Building Management and Maintenance Meaning Explanation' -

By- Iveta Puķītea, Mg. sc., Ineta Geipele, Prof., Dr. oec.

Modern Building Materials, Structures and Techniques, MBMST 2016.

FINDINGS: -

- Building management is a particular economic activity, a set of property maintenance, operation, repair and maintenance.
- This is a legal and technical set of operations required for building maintenance and preservation of usable condition, as well as functionally required for the maintenance of the land to ensure that property is used in accordance with the purpose. The aim of the paper is to conduct a literature review of different approaches to defining building management and building maintenance.
- The continuous growth of socially responsible building management indicates that there is a need for a more effective management system of the building lifecycle to provide sustainable residential property development.



3. 'A literature review on maintenance priority - conceptual framework and directions' BY-Alan Chong Kim Wing, Abdul Hakim bin Mohammed and Mat Naim bin Abdullah.

FINDINGS:

- The area of maintenance priority requires more systematic research efforts especially in the implementing approaches that includes organizational goals, stakeholder needs and inclusion of Corporate vision and operational requirement Demand assessment Performance evaluation Procurement strategy Decide strategy and priorities Systems and procedures MATEC Web of Conferences 66, 00004 (2016) DOI: 10.1051/mateconf/20166 IBCC 2016 600004 5 6 critical factors. Priority setting process that aligns with the need of the organization can assist in avoiding losses and improve the maintenance performance.
- Figure below presents a conceptual framework on maintenance priority which encompasses the findings of this study. The findings in this study contributes to the understanding of maintenance priority setting esp.

4. A STUDY INTO THE IMPACT AND SUITABILITY OF BUILDING MAINTENANCE PRACTICES OF LOCAL COUNCIL BUILDINGS ON PERFORMANCE OF FLOOR FINISHES

FINDINGS:

- The local council needs to come up with a maintenance policy that is grounded on planned preventive maintenance.
- The councils have adequate information from past records regarding maintenance that can be used to forecast future maintenance requirements.
- For planned preventive maintenance to be successful, inspection, detection and prevention of incipient failures has to be put in place in building inspection cycle done at regular intervals is therefore important in this case.
- A feedback mechanism should be set in place to facilitate feedback in formation on the same to the city engineer's department that is in charge of making decision on the type of floor finishes to be used and in what areas.
- To minimize this, it is recommended that the floor finishers be polished regularly at appropriate intervals. This will ensure that it is the polish that wears off and not the flooring material itself.
- The councils need to upgrade their workshops to improve their competency in carrying out various maintenance works such as a repair of terrazzo floors.

5. ASSESSMENT OF BUILDING SURVEY AS A TOOL FOR BUILDING MAINTENANCE PROGRAM A STUDY OF AWKA, ANAMBRA STATE

By - Iheama, N. B.; Alinta-Abel, U. and Ezeokoli, O. F.

International Journal of Civil Engineering, Construction and Estate Management Vol.5, No.1, pp.1-15,

March 2017 FINDINGS:

- The application of this activity (building survey) by individual building owners, professionals in the building industry and the government is very low and in some cases are not used at all.
- This has led to the present state of despair with some attendant problems facing the Nigeria building industry.
- Therefore, Nigeria building owners and professionals in the building industry and the government should welcome this fact and fully adopt and implement it to enhance the sustainability of our buildings and maximization of serviceability and satisfaction.
- This will also enhance the development of the economy and comfort of the users of these buildings.



6. 'BIM- and Mobile-Based System for Supporting Facility Maintenance Management'

By- Chin-Yu, Lina, Kun-Chi, Wang, Tse-Yu, Kuoa, Li-Hsi, Yanga, Wei-Chih, Wang.

35th International Symposium on Automation and Robotics in Construction (ISARC 2018)

FINDINGS: -

- Integrating BIM based maintenance management system and mobile computing is feasible via the development of a mobile application. The integration provided by this system is significant in three aspects.

First, BIM can support information exchange through the internet by providing BIM model information to MySQL database.

- Second, 35th International Symposium on Automation and Robotics in Construction (ISARC 2018) the 3D model visualization module allows BIM model to be viewed through mobile devices with augmented reality technology.
- Third, a truly complete integration between BIM and maintenance management system in enabling data exchange from maintenance management system back to BIM model.

Overall, the proposed system demonstrated its effectiveness in enhancing the current BIM-based maintenance management system applications.

7. Maintenance Management Practices for Building Facility: A Case Study BY- Zul-

Atfi Ismail, Narimah Kasim.

International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 FINDINGS:

- There is a total of eight case studies have been used to analyze the key problems, approach to address problems, ICT implementation and maintenance management system at polytechnic.
- The factor of nonspecific complaint, defect repetition, limited budgets, time gap of building repairs and less competent manpower are the main problems on the case studies findings.
- In order to improve information adequacy in the complaint, the new system will be developed which provides building attributes, for instance, the facility type, defect and location in detail.
- Other than that, the new system can manage budgets on ad hoc and preventive maintenance effectively. □ It can improve the decision-making process and maintenance management at Polytechnic.

IV. PROBLEM STATEMENT

Many occupants in residential projects in various parts of the city are often running into difficulties in resolving maintenance and repair works. So, it sometimes results in an increase in time and unknown costing of the repair work. Proper maintenance prioritization enables organization to ensure their maintenance performance remains in the acceptable level. This study shows the major issues faced by the occupants in a residential building. Many a Previous case studies had been shown the various factors and methods to minimize the maintenance issues faced by the residents but still these issues sometimes are delayed to achieve a solution due to various reasons. It indicates that there is either lack of awareness of the suggested construction practices or there are limitations for the effective adoption of their suggestion. It may vary from each case study of the construction projects.

Maintenance can help:

- Prevent the process of decay and degradation.
- Maintain structural stability and safety.
- Prevent unnecessary damage from the weather or from general usage.
- Optimize performance.
- Help inform plans for renovation, refurbishment, retro fitting or new buildings.
- Determine the causes of defects and so help prevent re-occurrence or repetition. □
- Ensure continued compliance with statutory requirements.



Therefore, it is necessary to give attention on the effectiveness of building maintenance practices and repair time to time.

- The research is beneficial for organization therefore targeted at providing effective solutions to the following:
To help to understand the necessity of building maintenance.
- To Understand MEP and its usage
- To know the process of MEP
- To have a better approach towards MEP
- To improve Professionals for the efficient & effective way to maintain infrastructure.
- To give solutions on how to maintain a building
- To give solutions on the criticality of Poor maintenance & approach.

Many occupants in Pune city was failed in finding the solutions related to poor maintenance and complicated repair works. Therefore, it is necessary to give better control of the problems and limitations of same for future residents. This proposed project work will help in finding the effectiveness of repair and maintenance by new effective methods.

V. METHODOLOGY

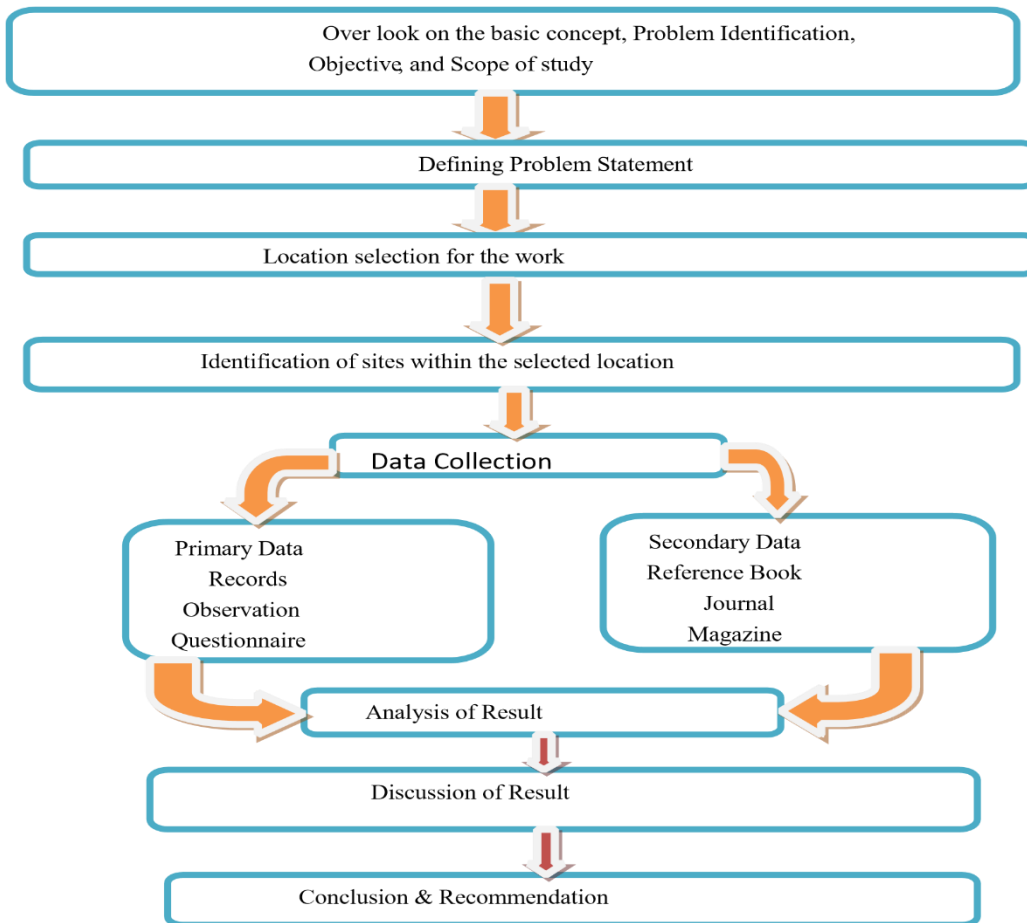


Fig-1



VI. QUESTIONNAIRE FORMAT

SECTION A

GENERAL DESCRIPTION OF CONSTRUCTION PROJECT

Please, note on option and give feedback.

Construction project Name:

Address:
.....

Q1. Position of respondent in the flat

- 1) Owner 2)Tenant

Q2. Type of issue

- 1)Major issue 2) minor Issue

Q3. Maintenance issues after possession

- 1)Plumbing 2)Electrical
3)Tiling 4)Fabrication
5)Painting 6) wall crack

Q4. Specify the exact issue below

Q5. Time taken to repair the damage

- 1)A day 2)Few days
3)A week 4)A month

Q6. Specify the exact time below

Q7. Cost of the repair work

- 1)Rs.100-500 2)Rs.500-1,000
3)Rs1,000-5,000 4)Greater than Rs.5,000

Q8. specify the exact amount below?

Q9. Medium of contact for maintenance man

- 1)Friend 2)Advertisement
3)Internet 4)Project developer

Q10. Difficulty Faced in finding the repairman

- 1)No difficulty 2)Few difficulty
3)Quite difficult 4)A lot of difficulty

Q11. Were you aware of whom to consult for repair work

- 1)Yes 2)Not sure
3)No



Q12. Was there any delay in repair

- 1) Yes,
- 2) No

Q13. Reason for delay in repair work

- 1) Lack of information
- 2) Availability of repair man
- 3) Availability of material

Q14. Difficulty Faced in repairing the damage

- 1) No difficulty
- 2) Few difficulty
- 3) Quite difficult
- 4) A lot of difficulty

Q15. Was the problem resolved

- 1) Yes
- 2) Somewhat
- 3) No

Q16. Were you given a proper explanation about the problem

- 1) Yes
- 2) Somewhat
- 3) No

Q17. Were you satisfied with the service

- 1) Yes
- 2) Somewhat
- 3) No

Q18. How would you rate your experience from 1 to 5

Q19. Have you ever come across/aware of any residential repair and maintenance services app

- 1) Yes,
- 2) No

Q20. If yes specify it below

Q21. Would you prefer a mobile application to approach a service provider for the repair work?

- 1) Definitely Yes
- 2) I would give it a try
- 3) I am not sure about it
- 4) Definitely No

Name of respondent:

Signature:

Date:



SECTION B

MEP for residential building:

- Please, note on option and give feedback.

- 1) How helpful is MEP consultant for a project?
 - a) Somewhat helpful
 - b) Very helpful
 - c) Not at all helpful

- 2) Is MEP helpful for commercial as well for residential projects?
 - a) Yes
 - b) No

- 3) Is MEP useful for repair maintenance of a project?
 - a) Yes
 - b) No

- 4) Can it be used for maintenance of a residential project?
 - a) Yes
 - b) No

- 5) How much is the average MEP fees?

- 6) How is it calculated?

- 7) Does it vary from project to project?
 - a) Yes
 - b) No

- 8) What are the reasons for the variation?



9) What would be approx. cost for a project ranging from 1-2 crore?

10) What would be approx. cost for a project ranging from 10-20 crore?

11) What would be approx. cost for a project ranging from 20-100 crore?

VII. SELECTED LIST OF CONSTRUCTION PROJECTS

Sr. No.	Project Name	Sr. No.	Project Name
1.	Nano Homes, Ravet, Pune.	26	Sapphire Park Street, Wakad, Pune.
2.	Anshul Ballina, Ravet, Pune.	27	Capital Tower, Shankar Kalat Nagar, Pune.
3.	Golden Paradise, Ravet, Pune.	28	DNV Elite Homes, Wakad, Pune.
4.	VakratundAaditya Terraces, Ravet, Pune.	29	Rohan Tarang, Wakad, Pune.
5.	Jagtap Nano Spaces, Ravet, Pune.	30	Silver Skyscapes, Wakad, Pune.
6.	JAS Arihant Heights, Ravet, Pune.	31	Park Royal, Wakad, Pune.
7	GK Royalee Hills, Ravet, Pune.	32	Life Ville, Pimple saudagar, Pune.
8	RunalSpacio, Ravet, Pune.	33	Laxmi Angan, Pimple Saudagar, Pune.
9	Lotus Laxmi, Ravet, Pune.	34	Kunal Icon, Pimple Saudagar Pune.
10	Shankeshwar villa, shindewasti, Pune.	35	Kingston Avenue, Pimple Saudagar, Pune.
11	Silver Palm Grove, Ravet, Pune.	36	Tamara, Pimple Saudagar, Pune.
12	Little Earth, Ravet, Pune.	37	Sai Vision, Pimple Saudagar, Pune.
13	Park Titanium, Wakad, Pune.	38	Crystal Park, Pimple Saudagar, Pune.
14	Seville, Wakad, Pune.	39	Atul Alcove, Pimple Saudagar, Pune.
15	Icon Linera, Wakad, Pune.	40	24 Glitterati, Pimple Nilakh, Pune.
16	Dynasty Phase 2, Wakad, Pune.	41	Sagar Waters Edge, Pimple Nilakh, Pune.



17	Ethos Phase 2, Wakad, Pune.	42	NecoSkypark, Pimple Nilakh, Pune.
18	Akshar Elementa, Wakad, Pune.	43	Ovhal Spring, Pimple Nilakh, Pune.
19	Apex Athena, wakad, Pune.	44	Shriram Plaza, Pimple Nilakh, Pune.
20	Kalpataru Harmony, Wakad, Pune.	45	Sahil Heights, Pimple Nilakh, Pune.
21	Costa Rica, Wakad, Pune.	46	Aditya Comfort Zone, Aundh, Pune.
22	Yashadas Panache, Wakad, Pune.	47	Royal Orchard, Aundh, Pune.
23	Mont Vert One, Wakad, Pune.	48	West End River View, Aundh, Pune.
24	Opus 77, Wakad, Pune.	49	Kumar Prerana, Aundh, Pune.
25	Kasturi Epitome, Wakad, Pune.	50	Twin Towers Apartment, Aundh, Pune.

VIII. SELECTED LIST OF MEP CONSULTANT

VK: e Environmental
Shreeya Consulting Engineers

VIII. CONCLUSION

- Ranking of maintenance problems:

Table 6.1 Ranking Order of problems Faced:

RANKING ORDER	PROBLEM TYPE	PERCENTAGE OF TOTAL
1	ELECTRICAL WORK	27 %
2	PLUMBING ISSUE	34%
3	TILING WORK	15%
4	STRUCTURAL ISSUE	10%
5	PAINT ISSUE	8%
6	FABRICATION ISSUE	5%

- General observation for maintenance and repair for electrical and plumbing is due to improper installation of fitting and quality of material and poor construction.
- The survey carried out at 50 residential projects. With the help of above Questionnaire shows that most of the maintenance issues that were faced consisted of 27% of electrical work, 34% of plumbing issues, 15% of tiling work, 10% of wall crack issues, 8% of painting issues and 5% of fabrication issues.
- While 69% of residents took 2-6 days to have get it repaired while 31% took a 7-10days.



- Every resident paid eventually more for the services as they were unaware of the exact charges for the services Because of the unavailability of a proper resource to know about such services.
- 54% of the residents came to know about the service provider through friend and other associates, while 25% from the internet, 14% of the residents contacted the project developer team for such repairs and maintenance and rest of the 7% approached via advertisement.
- 94% of the sample size have not come across any specific application for these services, whereas 6% of sample size have come across an application like URBAN CLAP who's forte is not repair and maintenance services but it provides a few services.
- 41% knew the type of services provider to approach rest of 40% were not sure about it while the 19% knew nothing about hence 31% of the residents faced a lot of difficulty while 24% found it quite difficult, 27% few difficulty and 18% found no difficulty at all to the repair work done.
- The cost Factor majorly affects the MEP.
- The Average cost of a MEP consultant through the study can be calculated as **3% of the overall project cost**
- The cost of MEP consultant can vary from project to project.
- Various factors affect the cost such as type of structure, complexity of the project, type of materials to be used, type of equipment's to be used.
- As the study concludes that MEP consulting cost adds a very little cost to the overall project.
- Yet construction companies don't opt to increase their cost of construction. Hence, they try to neglect the MEP services. But it turns out to be more beneficial for the project.
- As the MEP is effective during construction it also its efficient form repair and maintenance as the layout provided by the consultant can help for a better way to figure the issue.
- MEP is more feasible for a long-term view as it reduces the maintenance cost by helping to identify the issue at start.
- MEP (Mechanical Electrical and Plumbing) Consultant is a better option as is 3 largely benefits:

1) 1. Improve Your Bottom Line

Heating, ventilation, and air conditioning (HVAC), lighting, plumbing, energy consumption and safety solutions are all elements that can impact the bottom line. Professional MEP consultants help owners achieve optimal building performance by maximizing energy efficiency, reducing redundancies and designing integrated, synergistic systems from the start.

2) 2. Optimize Energy Efficient Designs

Every commercial building project presents its own unique challenges. MEP engineering consultants provide customized solutions to improve a building's (new or existing) energy efficiency. Through energy modelling, a virtual simulation of a building's energy usage, MEP consultants understand the current energy consumption, make predictions on future consumptions and optimize designs to maximize efficiencies.

This can be across systems, including a combination of high-efficiency HVAC equipment, lighting retro-fits, LEED designs, photovoltaics, or other resource efficient and eco- friendly designs.

3) 3. Reduce Project Risk

Risk reduction, fast turnarounds, and cost control are essential for a successful building project. Modern construction and building renovations involve multiple, complex systems. If these systems are designed in isolation, it can lead to project delays and inflated costs.

- MEP consultants collaborate with all project team members to improve communication, ensure code compliance and avoid delays.
- When designing building systems, an integrated MEP engineering approach yields better results than specifying each building system in isolation. Interactions between building systems can be especially difficult to coordinate when the design process is isolated, and equipment location conflicts are very likely.



- Hence proper MEP Consultant is required for quality construction and to avoid frequent number of maintenance issue in future.
- Mobile applications can be a solution for the repair and maintenance in the the near future.
- Hence it is necessary adoption of new technology-based module in civil industry which has a brighter future and makes such services easily accessible.

The various reasons were identified from the literature review and to enlist the appropriate reasons for the questionnaire, opinions were taken from the experts in the particular fields and as per the opinions the final reasons for cost overruns were selected.

The authors can acknowledge professor, friend or family member who help in research work in this section.

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